Contested smart and low-carbon energy futures: media discourses of smart meters in the United Kingdom

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Abstract: The Smart Meter Implementation Programme (SMIP) is arguably one of the most expansive and complex smart meter programmes globally. The UK government regards smart meters to be enablers of a low-carbon energy grid and has set out ambitious consumer-orientated aims within their programme across England, Scotland, and Wales. Despite considerable amount of research on how consumers will (or not) engage with smart meters, media discourses, where some public debates about smart meters are created and reproduced, have received little attention. This paper presents a content analysis of how smart meters are discussed within 11 years of popular print media coverage. A collection of nine discourses are identified: Four of these – "empowered consumers", "energy conscious world", "low-carbon grid", and "future smart innovation" – depict smart meters as a harbinger of positive social change. Five of these – "hacked and vulnerable grid", "big brother", "costly disaster", "astronomical bills", and "families in turmoil" – represent smart meters as negative forces on society. The results show that discourses and associated storylines mainly represent continuous struggles over specific issues concerning particular socio-technical promises linked to smart meters. Somewhat missing are attempts to open up the smart energy debate to broader issues of democracy and energy justice within the print media coverage.

Keywords: smart grid, media discourses, futures, energy infrastructure

1. Introduction

Low-carbon energy transitions against the background of international efforts to mitigate and respond to climate change are among one of the most important international challenges. In this context, smart meters are beginning to play a prevalent role among efforts to decarbonize buildings, as they are frequently depicted as enabling smarter energy systems, grids, or cities, as well as energy use behaviour changes, that are hoped to lead to carbon emission reductions.

However, the promise of smart meters is by no means universal, or predetermined. On the one hand, several benefits and envisioned social changes have been associated with the rollout of smart meters (see, e.g., Darby, 2010). It is well known that households have very different consumption profiles based on factors such as household size and other demographic attributes, climate and geography,

availability of specific technologies, and individual lifestyles and preferences, to name a few (Wiesmann et al. 2011; Longhi 2015; Huebner et al. 2016; Salari and Javid 2017). As such, smart meters are said to have the potential to bring benefits to such complex classes of consumers in terms of reduced energy bills through a more efficient (and hence cheaper to run) energy system and through reduced energy consumption, stimulated by improved information about energy usage (Shivakumar et al. 2018). They can help facilitate demand response and the adoption of household solar photovoltaic (PV) panels (Kakran and Chanana 2018), or time of use tariffs to create a future smart grid where users are made part of, and receive revenues for, the provision of grid services (Pallesen and Jenle 2018). Gouveia et al. (2018) note that smart meters can better enable researchers (and policymakers) to tackle pressing social problems such as fuel poverty. Research in the United Kingdom (UK) for instance suggests that vulnerable consumers, including those where English is not their first language, can benefit from smart metering and save money on their energy bills (Utility Week 2017). Smart meters may also capture additional benefits, such as shifting energy consumption away from times of peak demand and/or times when the generation mix is higher carbon through the introduction of new services and products (Sovacool et al. 2017).

On the other hand, smart meters raise a host of potential concerns and risks. Sovacool et al. (2017) note that examples include:

- A dislike among households of the idea that energy suppliers might manage their energy consumption for them;
- Scepticism that smart meters will actually deliver savings and a perception that suppliers will somehow use them to profit at the expense of consumers;

- Concerns relating to privacy and security of data generated by the smart system;
- Beliefs that there may be health risks associated with wireless technology.

In the UK specifically, the Department of Energy and Climate Change (DECC, 2014) has noted that surveys over consumer acceptance were complicated by "confusion about what constitutes a smart meter" and that "smart meters are often confused with in-home displays; DECC also noted that only 31% of participants were "supportive" and that only 39% were "interested in having a smart meter installed in their home in the near future." More recently, Wilson et al. (2017) demonstrate contrasting or at least complex views of smart meters in the minds of potential adopters. After conducting a representative national survey of more than 1,000 homeowners in the UK, they found that prospective adopters had positive perceptions of smart meters (when integrated into smart homes) for their ability to enhance energy management, but this came with concerns over worries over loss of autonomy and independence, and low confidence in data security and privacy.

So far, much smart meters research has navigated these issues by focusing predominately on technical or economic dimensions (Sovacool et al. 2017). As Bager and Mundaca (2017: p. 69) write, "consistent with traditional policymaking, the attention [in the smart meter research community] has focused on technical issues, such as grid connectivity, the role of network operators, deployment rates, investment levels and cost-revenue ratios." It is important to note, however, that *social* factors will also have an impact on the success or failure of smart meters, especially broader public perceptions (and narratives or discourse) about this emergent technology.

Within this admittedly exciting yet contested domain, the Smart Meter Implementation Programme (SMIP) in the UK is of particular interest, considering such expected social and environmental changes: firstly, the UK government has set out ambitious consumer-orientated to the rollout of smart meters (Darby, 2010, Pullinger *et al*., 2014) across the three nations of England, Scotland, and Wales; and secondly, the rollout has been described as "by far the most complex" smart meter programme in the world (Lewis and Kerr, 2014:5). It will involve installing a combined 104 million pieces of new equipment (when counting separate electricity and gas meters), in-home displays (IHD) monitors and wireless communications networks into people's homes by 2020.

Socio-technical visions and expectations are acknowledged to play a crucial role in generating momentum for many technology innovations (e.g. Korsnes, 2016). These visions form in dynamic discourses within expert groups and broader public discussions. Considering the UK government's focus on consumer benefits, UK media coverage plays a key role in creating and reproducing smart meter discourses and associated visions of socio-technical changes. Despite considerable amount of research on how consumers will (or not) engage with smart meters, however, media discourses received little academic attention.

In this paper, we explore the SMIP from an inherently social or discursive angle combining the analysis of media discourses with futures research. We ask: How are smart meters (and their rollout) being discussed and envisioned within the UK print media over time?

To provide an answer, we conducted a content analysis of broadsheet and tabloid articles published in the UK media from 2006 to 2016. The result of this

search revealed a total of 205 documents that we then analysed to assess the prevalence of expected socio-technical changes, making use of Hajer's (1995) work on discourses and storylines. These were then divided into nine discourses. Four of these – "empowered consumers", "energy conscious world", "low-carbon grid", and "future smart innovation" – depict smart meters as welcome, secure, inclusive, and net beneficial innovation for society. Five of these – "hacked and vulnerable grid", "big brother", "costly disaster", "astronomical bills", and "families in turmoil" – represent smart meters as expensive, insecure, exclusionary and dangerous devices within households.

In proceeding on this path, the paper aims to make multiple contributions. It builds on the work of Langheim et al. (2014), Stephens et al. (2015), Mallett et al. (2018a), Mallett et al. (2018b), Peters et al. (2018), and Jegen and Philion (2018) that have conducted longitudinal studies of media discourses surrounding smart energy systems within Canada and the US. This paper moves the focus away from North America, where the developments of smart energy systems has mainly been grounded in debating commercial benefits , to the UK where "consumer benefit is at the heart of the Government's smart meter programme" (Energy and Climate Change Minister 2012), emphasising energy demand issues. The challenge is therefore not only to examine discourses of infrastructural developments related to supply side energy technologies, but also transformations surrounding how energy is used in domestic contexts such as the home (Gram-Hansen and Darby 2018).

Moreover, the paper aims to combine an examination of media discourses with futures research. Several studies have looked at socio-technical imaginaries of smart energy systems (Skjolsvold 2014; Tricoire 2015) and imagined users (Verbong et al. 2013; Ballo 2015), whilst others have focused on issues such as consumer

engagement (Gangale et al. 2013; Toke Haunstrup et al. 2013; Broman et al. 2014), domestication and learning (Hargreaves et al. 2018), and/or involving publics (Schick et al. 2013). Some of this research has tended to emphasize futures shared by technical experts or elites and how they imagine and involve consumers, users, and publics. Less research has emphasized futures promoted by the popular news media or members of the public themselves. Looking closely at the futures associated with the smart meter rollout, as conducted in this paper, potentially sheds light on how experts and the wider public mediate knowledge and make sense of phenomena.

In embarking on this path, Section 2 provides an historical background of the smart meter rollout in the UK. Section 3 outlines the conceptual and methodological approach of the study, drawing on the literature concerned with media discourses and sociotechnical imaginaries. This is then built on in Section 4 to present the findings, an analysis of utopian and dystopian imaginaries associated with the SMIP. Section 5 discusses the discursive substance of the smart meter rollout i.e. what is being said and by whom. The final section offers concluding reflections on what contradictory discursive politics mean for sustainability transitions as well as energy policy.

2. Background: The UK Smart Meter Rollout

Smart meters have played a central role in EU energy policy over at least the last decade. Driven by the EU Energy End-Use Efficiency and Energy Service Directive (2006), smart meters fully emerged on the energy policy agenda in the UK from 2006 onwards in parallel with a renewed focus on climate change. After conducting some consultations, but before completing all impact assessments and pilot studies (Darby, 2009), the government in the UK announced its decision to rollout smart meters for *all* households within England, Scotland and Wales, and

specified a provisional timetable for the rollout. Over the last decade, the SMIP has set in motion the development of an extensive regulatory, policy and technical arrangement, starting with the policy design phase (2010-2011), subsequently, the foundation stage (2011-2016), and finally, the implementation phase (2016 onwards to the end of 2020), as summarized in Table 1.

Table 1: Chronological Timeline of the Smart Meter Implementation Programme in the UK*

Date	Events	Phases
2006	Ofgem consultation on smart meters	
2006	EU Energy End-Use Efficiency and Energy Services Directive	
2006	Government announced: Energy suppliers to conduct a pilot study of feedback devices such as 'smart' energy meters	
2006	Ofgem review: International experience of smart metering	
2007	Re-election of Labour Party	
2007	Government consultation: Views on full roll-out of smart meters	
2008	Government announced: Rollout of smart meters to all households	
2009	DECC Impact Assessment of GB-wide rollout of smart meters	
2009	Government consultation different implementation models	
2009	European Commission Directive 2009/72/EC	
2009	DECC announcement: Have smart meters in all home in Great Britain by 2020	
2010	DECC prospectus for the Smart Metering Implementation Programme	2010-2011 Policy Design
2010	General election leads to coalition government of Conservative and Liberal Democrats	
2011	Government announcement: Start mass rollout in 2014 – Completion in 2019	
2011	Supplier start to install 'smart meters'	
2011	National Audit Office & Public Accounts Committee carries out review	
2012	DECC Consumer Engagement Strategy Consultation	2011-2016 Foundation
2012	Public Accounts Committee Second review	
2013	Government review of the programme: Delay	
2013	Launch of Smart Energy GB	
2013	Smart Meter Central Delivery (SMCDB) starts operation	
2013	DECC appointed: Data and Communications Company	
2014	Second enquiry from the National Audit Office	
2014	Delay of smart meter rollout	
2015	Energy and Climate Change Committee enquiry and report on rollout	
2015	Smart metering Early Learning Project: Synthesis report	

2015	Conservatives win general election	
2016	Science and Technology Committee enquiry and report on rollout	
2016	Start of main rollout	2016-2020 Main installation

Note: Ofgem=Office of Gas and Electricity Markets. EU=European Union. GB=Great Britain. DECC=Department of Energy and Climate Change. *Although it is being implemented within the UK, the smart meter rollout is only occurring across England, Scotland and Wales, and not Northern Ireland.
Source: Authors

Smart meters can digitally send electricity and gas readings to energy suppliers; several expected benefits have been advocated with the rollout of such technologies, usually being divided into benefits for householders, energy utilities, and energy providers. In addition to such short-term benefits (such as avoidance of billing problems and easier switching between suppliers), the rollout of smart meters also links to broader ideas of the future electricity system based on the smart grid (e.g. Stephens et al. 2015). It is thus an element of an envisaged broader transformation of the electricity sector (e.g. Darby and McKenna, 2012, Verbong *et al*., 2013).

Several rollout models were debated, with the government finally settling on making the energy suppliers responsible for the implementation of smart meters (DECC, 2012). In addition, energy suppliers are required to offer households an in-home display, a digital device that provides ”real-time” feedback on energy use to reduce their energy consumption. This requirement has been widely debated over the years, with energy suppliers arguing for cheaper alternative digital technologies. Although critiqued, the government has maintained its decision, having set up extensive consumer-orientated aims with the smart meter rollout (Darby, 2010; Pullinger *et al*., 2014).

Over the years, the rollout has been characterised by several negotiation phases, delays, and technical glitches. Multiple consultation phases around, for instance, consumer engagement, privacy, and technical specification issues initially

delayed the rollout. The main installation phase was initially meant to start in 2014 but did not begin until November 2016. In addition, several technical difficulties shaped (and delayed) the rollout, such as issues concerning switching between suppliers and setting up the digital infrastructure. Moreover, numerous parliamentary bodies (e.g. Energy and Climate Change Committee (ECC) and Public Accounts Committee (PAC)) scrutinized the rollout, pointing to "significant uncertainties over the estimated costs and benefits" (PAC, 2011:3) and "risk of falling short of expectations" (ECC, 2015:3). As of early 2018, slightly more than 9.5 million meters have been installed under SMIP (Department of Business, Energy and Industrial Strategy (BEIS), 2018) compared to the aim of installing a total of 56 million by 2020. Granted, the scale of the rollout has intensified considerably over the last year as suppliers have accelerated their efforts, and this trend looks likely to continue.

3. Combining media discourses with futures research

Examining media discourses linked with smart meters, whilst at the same time making sense of associated imagined futures, "could allow us [researchers] an insight on how images of the future are being shaped today" (Schirrmeister, 2014:38). To analyse the discourses and imagined futures surrounding the SMIP, we relied on two concepts –storylines and discourse coalitions– and one method, that of content analysis.. Innumerable ways to conceptualize discourses and futures exists within social sciences. Since the aim of this research is to examine media discourses connected to the futures of a political instrument and technological innovation, i.e. smart meters, we draw on Hajer's (1995) work and academics examining future orientated visions (e.g. Jasanoff and Kim 2009; van Lente 1993).

3.1 Media discourses and discursive struggles

Hajer (1995:44) defines discourses "as a specific ensemble of ideas, concepts, and categorisations that are produced, reproduced, and transformed in a particular set of practices and through which meaning is given to physical and social realities". His work focuses on how discourses define policy problems, in particular, what kind of political consequences such definitions have and how some discourses come to dominate others (Hajer, 1995:13-14). This emphasis on discourses embedding themselves and becoming dominant is of relevance to this research, as it draws attention to the "battles over interpretations" and the "discursive struggles" over certain problems, and in this case also the "technological solutions" that result.

Hajer (1995) concpeutalizes his discourse analysis approach around two main conceptualizations: 1) storylines and 2) discourse coalitions. A storyline is defined by Hajer (1995:56) as "a generative sort of narrative that allows actors to draw upon various discursive categories to give meaning to specific physical or social phenomena". Storylines are therefore simplified narratives of broader debates and argumentative processes. Actors can make use of them to reduce complexity, potentially reaching discursive closure as certain storylines become more accepted than others. In doing so, actors create discourse coalitions i.e. "groups of actors that – for various reasons – are attracted to specific (set of) storylines" (Späth, 2012:1260).

When assessing the storylines and discourse coalitions associated with fracking technologies, Schirrmeister (2014:3) state that the "media plays a key role in creating and reproducing storylines and images of the future". Several academics have considered media discourses to play a role in shaping how the wider public make sense of a phenomenon, creating an "important mediating process between expert knowledge and the wider understanding of the public" (Becken, 2014:126).

Similarly, Gamson and Modigliani (1989:3) have argued "if one is interested in public opinion, then media discourse dominates the larger issue culture, both reflecting it and contributing to its creation". Moreover, media discourses "present an important area for contestation for all those – scientists, consumers, policy-makers, producers – who seek to impose their interpretations of reality on others" (Loeber *et al.*, 2011:151, drawing on Hajer, 2009).

Media discourses and associated struggles do not only play a role in making sense of empirical phenomena (such as the smart meters rollout) in the present, but also draw attention to what is considered to "be possible, probable, and desirable developments in the future" (Schirrmeister, 2014:2).

3.2 Smart energy systems discourses and futures research

As argued by Stephens et al. (2015), smart energy systems have been connected to several socio-technical expectations, including promises and pitfalls. Multiple visions and technologies have been developed by several societal actors (Cherry et al. 2017; Ballo 2015). The content of these envisioned futures depends on the social and political context in which they are shaped. Not all visions can simultaneously be met, creating tensions among interpretations, expectations, and promises (Stephens et al. 2015). It is therefore open-ended concerning who may benefit, who may pay, and who writes the rules of future energy systems.

Viewing smart meters media discourses as ways to examine differing future-orientated visions has advantages. It emphasizes a performative element to socio-technological developments, underscoring that visions associated with technology can be "collective, durable, capable of being performed; yet they are also temporally situated and culturally particular" (Jasanoff, 2015a:19). Given that such

sociotechnical projects travel from vision and conception to realization, the notion of visions helps uncover the process of extension, where particular ideas gain traction, acquire strength, and influence the materialisation of actual structures (van Lente and Rip, 1998).

Moreover, future visions have an inherently subjective element, making them unique: one person's utopia can be another's dystopia. As argued by Stephens et al. (2015), in the case of smart energy systems "prophets of the utopian and dystopian futures" and more "mundane perspective" directly influence developments. Investigating smart grid media discourses in Canada, Mallett et al. (2014, 2018) have found that positive attributes of a smart grid have been emphasised until the deployment of smart meters, where public discourses around the pitfalls became much more prevalent. The study demonstrates the potential close interlinkages between futures visions and their materialisation, where images of the future are being shaped today. As argued by Schirrmeister (2014: 3) "the dominant meaning ascribed to it [technology] in public and political discourses determines its futures".

3.3 Methods: Content analysis of smart meter media discourses

The main data source for our analysis consisted of articles from UK national newspapers, containing the keyword "smart meter" at the start of the article and listed in the LexisNexis database. The purpose was to cover earlier storylines and discourse coalitions about the rollout of smart meters, i.e. since the introduction of the European Union Directive, and throughout the policy design and foundation stage until the start of the mass-rollout. Therefore, the analysed period was from January 2006 to December 2016.

In order to analyse the articles in depth, the LexisNexis search excluded documents containing fewer than 500 words. The resulting corpus included 249 publications. After closely reading the documents for their relevance to the smart meter rollout, 205 articles were chosen for final analysis. There was a steady increase in the number of articles being published until 2014, including one peak in 2009, when the UK government announced the rollout of smart meters and another in 2015, when the SMIP had been publicly critiqued for being delayed several times (see Figure 1).

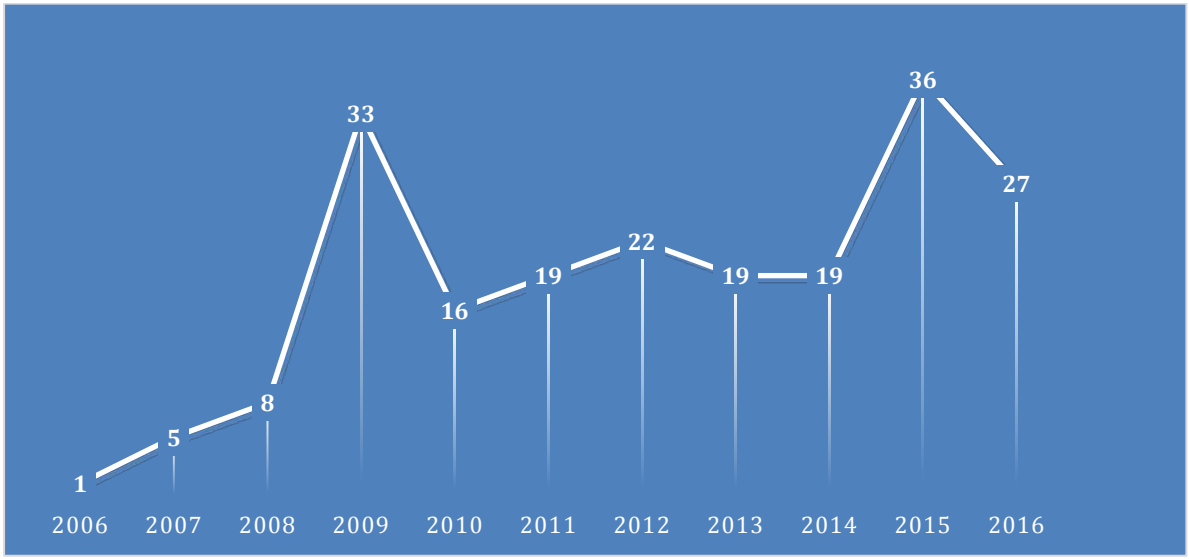

Figure 1: Newspaper Articles Discussing Smart Meters in the United Kingdom, 2006-2016 (n=205)

Source: Authors

Admittedly, the search term “smart meter” might have limited the search, as it did not include less direct references to these technologies, and wider associated topics, for instance, around ”smart cities”, ”smart homes” and ”smart grids” as well as ”digital society” or ”prosuming”. Our choice of limiting the search to “smart meters” was purposive in order to focus the examination on discourses surrounding the smart meter rollout specifically, to be able to see the role they have taken in the public

sphere. Both broadsheet and tabloid press were included in the analysis. Although "broadsheet" press has argued to be the "quality" press (as mentioned by Porter and Hulme, 2013), Dirikx and Gelders (2010) suggest that the analysis of "tabloid" press is of high significance when researchers are interested in public discourse, considering that large proportions of the population read tabloid newspapers.

In order to create a manageable sample of articles, and focus the analysis on storylines and discourse coalitions, three additional limitations are worth mentioning: firstly, we have only examined the UK context, secondly, we mainly concentrated our analysis on newspaper communications, using the term "smart meters" as a search term within the LexisNexis database, and finally, we did not explore in detail the connections between particular newspapers (such as *The Guardian*) given that the stories tended to differ not based on specific newspaper, but the author (especially for opinion and editorial articles). We thus often see competing and contested storylines emerging from within the same publication.

To be able to identify discourse coalitions, all sources paraphrased and quoted in the media articles were documented, including their date of publication, associated storylines, and positioned expressed. The sources ultimately included statements from parliamentary committees, consumer protection organizations and government ministers, to mention a few. Although quotes can be taken out of context and paraphrased sentences can change meanings, Takahashi and Meisner (2012:352) have argued that such articles can reflect "the actual position of the actors". This media data was triangulated with existing literature on smart meters to verify some of the findings from the content analysis. The documentation of quotes and sources provided the basis to identify discourse coalitions over time and possible discursive struggles between them. As such, the aim of our analysis is to provide a better understanding of

the contestations surrounding the rollout, what is being debated (or not), who takes part in these debates (or not), and how some discourses come to dominate (or not) over time (Hajer, 1995).

Within the sample of media articles, the authors inductively identified early on a broad division between future visions of promises and pitfalls associated with the rollout of smart meters, shaping the narratives – a division of futures that others have recognized in previous discourses on emerging technologies (see for instance, Burke, 2004). The coding process therefore focused on associated storylines, discursive struggles, and discourse coalitions. This process was inductive and the boundaries and distinguishing features of each storyline overlap. Nonetheless, nine positive and negative discourses were identified. Four of these – "empowered consumers", "energy conscious world", "low-carbon grid", and "future smart innovation" – depict smart meters as a harbinger of positive social change. Five of these – "hacked and vulnerable grid", "big brother", "costly disaster", "astronomical bills", and "families in turmoil" – represent smart meters as destructive, negative forces in society.

4. Results: Discursive pitfalls and promises within the media on smart meters

4.1 Positive discourses

Our final sample of 205 newspaper articles reveals four prevalent, recurring discourses, as Table 2 summarizes. The most frequent discourses (n=131) was one of "empowered consumers", followed by "energy conscious world" (n=118), "the low-carbon grid" (n=48), and "future smart innovation" (n=14). As Table 2 also summarizes, such discourses have different discursive elements, symbolic cues (recurring phrases), discursive struggles (relevant for two of the discourses), and discourse coalitions. Figure 2 offers a high-level summary of how such discourses peak and evolve over time.

Table 2: Summary of Four positive discourses surrounding smart meters in the UK

Discourse	Frequency	Description	Symbolic Cues	Discursive struggles	Discourse coalitions
Empowered consumers	n=131	Smart meters will facilitate consumers to manage and control their energy use/bills through more transparent and accurate bill reading, easier switching between suppliers, choosing flexible tariffs, and prosumption.	"More control over energy usage"; "better position to bring… bills down"; "prosuming enabled"; "take advantage of off-peak deals"; "accurate bills"; "switch suppliers more quickly"; "end to shocking utility bills"; "newly empowered consumers"	1) Savings on energy bills being made (at what point and how high) 2) Technologies enable social/financial possibilities (such as switching between suppliers)	Environmental think tanks, energy based social enterprises, government ministers, government energy department, UK government, UK energy regulator, price comparison company Later on, government energy department, UK government, government ministers, the national campaign for the smart meter rollout
Energy conscious world	n=118	Smart meters will enable consumers to grasp their energy patterns, saving energy and making homes more energy efficient. They are also considered to be vital for monitoring, managing and distributing energy more efficiently within the grid.	"Wasting electricity at home"; "reconnect us with our energy use"; "energy-conscious world", "greater environmental awareness"; "boost energy efficiency"; "consign many of the inefficiencies… to the history books"	1) Energy reductions/ savings in people's home 2) Sustainment of energy savings over time in people's homes 3) Necessity to rollout of in-home display in addition to smart meter in order to enable household energy savings	Consumer protection organization, non-government organizations, UK energy regulator Later on, energy companies, government energy department, UK government, and even later on the national campaign for the smart meter rollout
The low-carbon grid	n=48	Smart meters will promote/ enable the decarbonization of electricity and gas.	"Cutting carbon emissions"; "low-carbon energy future"; "green revolution"; "combating climate change"; "pave the way for the use of renewable power sources"	-	Parliamentary committees, government ministers
Future smart innovation	n=14	Smart meters will enhance industrial strategy and economic competiveness.	"Boost to competition and innovation in the energy market"; "more exciting new innovations"; "new smart home products"	-	Energy companies, electronic industry actor

Source: Authors

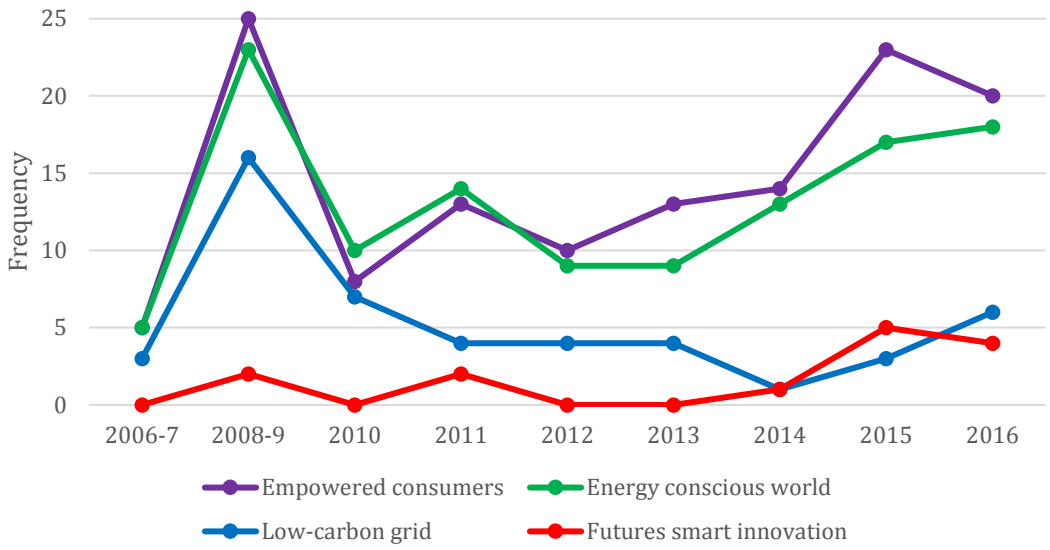

Figure 2: Frequency of positive smart meter discourses over time (2006-2016)[1]

Source: Authors

4.1.1 Empowered consumers

The discourse of "empowered consumers" – the most prevalent positive discourse from our sample of media articles – presents smart meters as a pathway towards creating more empowered consumers. This empowerment can come from a variety of means, including more accurate household energy bills, prosuming through micro-generation at home, easier managing of one's energy use, ending of debt related to energy bills, choosing favourable tariffs, easier switching between suppliers, and, best of all, cutting energy bills in the home. Contestations that emerged from the newspaper articles associated with "empowered consumers" were grounded in debating the validity of the socio-technical promises connected to smart meters (such as switching between suppliers) and the likelihood of savings on energy bills.

[1] Multiple imaginaries existed in a single article. Such imaginaries were added up to derive at the frequency of utopian smart meter imaginaries.

Between 2006 and 2009, several storylines were part of the discourse of "empowered consumers" that were linked to a diverse set of actors (e.g. think tanks and government ministers). The possibility of introducing more accurate energy household bills was the most stable and permanent theme alongside two more contested storylines around choosing tariffs that suit people's needs and saving money on energy bills. *The Times* (2008) wrote, "smart meters, which measure exactly how much energy is used at all times… as well as helping consumers to identify ways to reduce their usage and their bills". *The Independent* (2009) concurred by quoting the Energy and Climate Change Secretary, "smart meters will empower all consumers".

From 2006 onwards, the storyline of "savings on energy bills" proliferated to a diverse set of actors (e.g. environmental think tanks, the government's energy department, and the UK energy regulator). The storylines ranged from stating *calculated savings*, "these meters help cut power bills by between 3% and 15%" (*The Guardian*, 2007), in particular, between 2008-2011, writing about *potential savings*, "arguing that they will encourage families to save money" (*The Daily Telegraph*, 2012), through to indicating *savings that are in the hands of the consumer*, "smart meters will put consumers in control of their energy use… and helping people to save money" (*The Telegraph*, 2014).

From 2012 onwards, environmental think tanks and energy based social enterprise institutes were no longer a primary part of this discourse coalition. The departure might have had several reasons, such as increasing contestations surrounding the likelihood of saving money on energy bills and the increasing costs of the rollout from 2012 (see 2012 peak in Figure 2, above). For this actors' group, the storyline changed to "demanding 'actual' benefits for consumers", for instance, a consumer group warned, "customers, who will ultimately foot the bill, need to be

confident that they will see tangible benefits that give value for money" (Consumer Focus in *The Daily Telegraph*, 2012). From 2014 onwards, the imaginary of the "empowered consumer" was mainly constructed by the UK government, government ministers, the energy department, and the national campaign for the smart meter rollout, and grounded in consumers "should eventually save money" (2012).

4.1.2 Energy conscious world

The "energy conscious world", the second most frequent positive discourse, focused less on empowerment and moneymaking, and more on better comprehension of energy patterns and consequent improvements in energy efficiency within households (and the grid). Contestations associated with the utopian imaginary consisted of debating the likelihood of (sustained) energy savings in households and the necessity of rolling out particular feedback technologies (such as in-home displays) to enable such savings.

Between 2006 and2009, consumer protection organizations, non-government organizations, and the UK energy regulator argued that consumers could gain clearer information on their energy use through the rollout of smart meters, potentially reducing their energy use (see peak 2008/2009 in Figure 2). At the time, *The Guardian* (2009) wrote, "consumers and small business owners could benefit from savings achieved through increased awareness of their energy use". Similarly, *The Independent* (2008) quoted, "this will fundamentally change our relationship with energy use". In 2010, energy companies, the energy department, and other government actors joined the coalition, talking about how consumers could cut their energy use through smart meters.

From 2012 onwards, this discourse coalition no longer included consumer protection organizations and non-governmental organizations but mainly energy companies (in particular, British Gas) and the UK government, and from 2015 onwards also the national campaign for smart meter rollout. At the time, *The Sunday Telegraph* (2015) quoted the national campaign for the smart meter rollout, arguing, "people who already have a smart meter receive 'easy access to clear information… about how much gas and electricity they are using'".

Disagreements in this storyline appeared in 2013 and 2014, when energy companies argued for "removing the obligation of the mandatory requirement if in-home displays significantly reduce the costs of the smart meter programme to consumers" (*The Telegraph*, 2013). As a result, the energy department responded "In-Home-Displays will give consumers easy access to information on their energy consumption in pounds and pence, to help them manage and control their energy use" (*The Telegraph*, 2013).

A less prevalent rhetorical component of the "energy conscious world" discourse derived from government actors, energy companies, and later on the national marketing campaign associated with the rollout. It was grounded in envisioning the possibilities of smart meters enabling the efficient management of energy resources through better management of supply and demand, and reducing peak demand. The storyline peaked in 2008-2011, 2013, and 2016. For instance, in 2009, *The Guardian* wrote "smart meters help contribute towards more efficient – and greener – management of the electricity grid", and in 2011 emphasized that "sophisticated monitoring systems [i.e. smart meters] as part of a smart grid will allow the network to match demand with supply in a far more efficient way".

4.1.3 The low-carbon grid

The discourse of the "low-carbon grid" explicated the carbon and environmental credentials of smart meters. This discourse was less prevalent in the newspaper articles over time, and it also included no real contestations. From 2007, parliamentary committees and, in particular, government ministers constructed this discourse, connecting smart meters with reduced carbon emissions.

In 2009, *The Guardian* wrote "David Cameron will set out his vision today for a low carbon Britain built around a £1bn investment in a hi-tech National Grid that would include putting 'smart meters' in every home in the UK" (*The Guardian*, 2009). This imaginary was further built upon when linking smart meters to enabling a smart grid; "Smart grids will help manage the massive shift to low carbon electricity such as wind, nuclear and clean fossil fuel" (*The Guardian*, 2009). After regular contestations around the costs of the rollout and increasing energy bills, the Science and Technology Committee (SCT) was referred to in the Express Online (2016), arguing that "it would be 'easy to dismiss the smart meter project as an inefficient way of saving a small amount of money on energy bills' but evidence suggested there were major national benefits such as a smarter and more secure grid and reduced pollution".

4.1.4 Future smart innovation

This discourse of "future smart innovation" was the least prevalent. It emphasized the contributions the smart meter rollout could offer for industry, innovation, and economic competiveness. Similar to the discourse on climate change, it was largely uncontested. The discursive coalition here involved primarily energy companies.

From 2011, the discourse was mainly grounded in developing novel services "to boost competition and innovation in the energy market" (*The Times*, 2009). *The*

Independent (2014) wrote, "they [smart meters] also create opportunities for innovative new services to be developed". From 2014, these storylines were linked to smart home and smart city. For instance, in 2011, *The Guardian* (2015) wrote that "the smart city is an alluring vision of the future, in which civic technology such as traffic lights, smart meters for utilities and public transport could all be connected and feedback invaluable data online".

4.2 Negative discourses

Discourses about smart meters, interestingly, were not only positive. Our sample also revealed strong negative discourses summarized in Table 3. In order of the most prevalent, these included "costly disaster" (n=105), "astronomical bills" (n=93), "big brother" (n=47), "the hacked and vulnerable grid" (n=18, and "families in turmoil" (n=9). Figure 3 reveals how, similar to the positive discourses, these negative ones also evolve over time. Moreover, all but one of these narratives—"families in turmoil"—display degrees of contestation.

Figure 3: Frequency of negative smart meter discourses over time (2006-2016)

Source: Authors

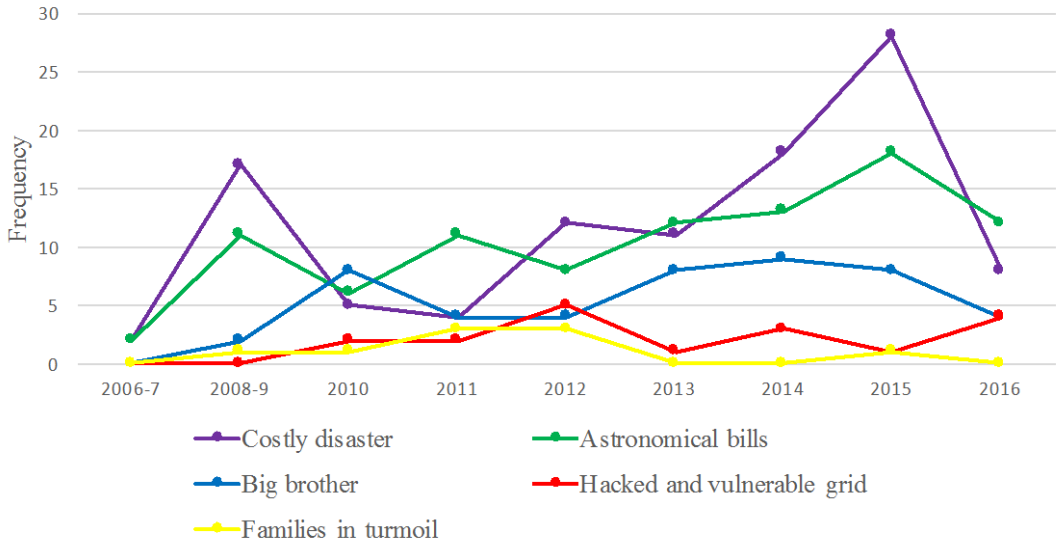

Table 3: Summary of five negative discourses surrounding smart meters in the UK

Discourse	Frequency	Description	Symbolic Cues	Discursive struggles	Discourse coalitions
Costly disaster	n=105	The smart meter rollout will be a publicly funded technological and financial disaster with inconclusive benefits and outdated and faulty technology	"Could cost far more"; "becoming a costly disaster"; "government IT disaster"; "embarrassing and costly failure"; "uncertain benefits"; "white elephant"; "the most complex in the world"; "danger of speedy obsolesce", "replacing old meter is a nightmare"; "do not work in several types of buildings"; "benefits that will not justify the costs"	1) Cost-effectiveness of the rollout 2) Transparency and validity of impact assessments of the rollout 3) Substantiality of technological promises	Energy trade association, professional services firm Independent parliamentary body, parliamentary committees, consumer protection organizations, academics, a professional institute
Astronomical bills	n=93	Consumers will be 'forced' to install and 'shoulder' the costs of smart meters, which will only lead to higher energy bills.	"Should not have to shoulder heavy costs"; "cost is passed on through bills"; "ever-increasing bills"; "could increase the price of electricity up to a third"; "astronomical bills"; no "cap on costs"; "additional cost people can ill-afford"	1) Consumers reducing their energy bill 2) Savings from, for instance, energy companies, to be passed on to consumers 3) Who should 'shoulder' the costs; who financially benefits from the rollout 4) Trust in energy companies	Campaigners, consumer protection organizations, price comparison companies, energy consultancies, independent parliamentary body, parliamentary committees, academics
Big brother: spying and controlling	n=47	Smart meters will erode privacy protections: companies gaining information about people's lifestyles and potentially controlling home appliances.	"The 'spy' in the home"; "able to 'snoop' on people's lives", "invasion of privacy"; "feel even more captive"; "permanent window on their private life"; "lack of trust in suppliers"; "'honeypot' of data"; "tiny bit Big-Brother-ish"	1) Data being misused 2) Acceptability of automated and/or remote control of home appliances	Academics, data analysis companies, campaigners, pressure groups, consumer protection organization, charities, independent parliamentary body, European regulator
Hacked and vulnerable grid	n=18	Smart meters can facilitate criminal theft of data or sabotage of the electricity or gas network	"Vulnerable to hacking and manipulation"; "national cybersecurity vulnerability"; "foreign computer hackers"; "hostile act against Britain's critical national infrastructure"; "leaving the national grid crippled"	1) Cyber security risks 2) Capacity to remotely cut off networked system	Security consultancies, security think tanks, intelligence and security organizations, parliamentary committees, academics, independent parliamentary body
Families in turmoil	n=9	Smart meters will disrupt family routines and can lead to the policing of activity by children, partners and parents	"You're destroying the planet"; "I had to keep nagging my husband"; "a kind of eco-police force"		Academics

Source: Authors

4.2.1 Costly disaster

The most prevalent negative discourse focused on the smart meter rollout as a "costly disaster". The rollout was envisioned to be a publicly funded technological and financial calamity with inconclusive benefits for consumers, and with outdated and faulty technologies being rolled out to nearly every household in the UK. Contestations associated with this negative discourse consisted of debating the transparency and validity of impact assessments (such as the cost-effectiveness of the rollout and the achievement of several benefits) and substantiality of socio-technical promises (such as the possibility of switching between suppliers more quickly and easily).

Before the decision was taken to rollout smart meters in 2009, calculations of the costs of the rollout varied greatly and were highly debated in the newspaper articles (see 2008-9 peak in Figure 3). For instance, the energy trade association claimed, "smart meters will be "cost-neutral"" (*The Guardian*, 2009), whereas a professional services firm argued, "the government has underestimated the cost of a nationwide rollout of smart meters" (*The Times*, 2009).

A coalition of actors, who had shared storylines connected to this dystopian discourse, emerged from 2011 onwards in the newspapers (see 2012 peak in Figure 3). The coalition consisted of several parliamentary committees, consumer protection organizations, and academics pointing to uncertain costs and benefits, and warning that costs might escalate. The coalition, in particular, drew substantively on two publications: one produced by the National Audit Office (NAO, 2011), cautioning that the rollout "could end up costing more than it is supposed to save" (*The Times*, 2011) and another written by a parliamentary committee (Public Accounts Committee

(PAC), 2011). A consumer protection organization referred to the latter report, arguing in one of the articles "that the roll-out might end in "embarrassing and costly failure" (Which? in *The Daily Telegraph*, 2012).

Parts of the coalition emerged again more frequently in 2014 and 2015, after the publication of two additional parliamentary committee reports (Public Accounts Committee (PAC), 2014, and Energy and Climate Change Committee (ECC), 2015) and a professional institution (Lewis and Kerr, 2015) report. In *The Sunday Times* (2015) the Industry of Directors (IoD) described the rollout as an "'IT disaster waiting to happen', as well as 'over-engineered and mind-blowingly expensive', and said it should be 'halted, altered or scrapped'" (see 2015 peak in Figure 3). Members from the committees were quoted in several newspapers, drawing attention to a diverse set of technological difficulties (e.g. lack of interoperability between suppliers' meters and technological obsolescence).

Since 2011, a discourse coalition between the energy department, the UK government, and later on the national campaign for the smart meter rollout argued that costs would arise but that benefits would be higher. "The investment in our national digital upgrade will be far outweighed by the savings" (Smart Energy GB in *The Telegraph*, 2015). From 2015, these arguments shifted their stance to be more conservative, arguing that savings will eventually be made and the rollout was challenging but on budget.

4.2.2 Astronomical bills

The "astronomical bills" discourse emphasized the financial setbacks of households connected to the rollout, especially in situations where smart meters enabled energy companies to charge more at peak times through new tariffs, keep savings and fail to

pass savings on to consumers, or disconnect non-paying customers. This negative discourse focused on consumers having to "shoulder" the costs of smart meters without any tangible mechanism being in place to accrue the proclaimed benefits, which would only lead to higher energy bills for households. Contestations associated with this negative discourse consisted of debating the probability of consumers reducing their energy bills through using less energy in the home, the readiness of consumers choosing tariffs that help them reduce their bills, the ability to switch more easily between suppliers in order to get the cheapest deal, and the likelihood of energy companies' savings being passed on to consumers through lowering their bills.

From 2008 onwards (see 2008-9 peak in Figure 3) and through to 2016, a discourse coalition of consumer protection organizations and energy consultancies emerged in the newspaper articles, sharing the storyline that "homeowners should not have to shoulder heavy costs for the new meters" (*The Guardian*, 2009). Although consumer protection organizations and industry actors agreed that smart meters needed to be rolled out in 2008, a variety of consumer protection organizations and energy consultancies were concerned about increasing costs for consumers. For instance, an energy consultancy argued "we are concerned that this is another example of smoke and mirrors by the energy industry who are clutching at straws to create a positive story, when the real scandal is that they are making a profit" (*The Guardian*, 2009).

From 2012 onwards, the parliamentary committees joined the discourse coalition, arguing that "consumers will benefit from smart meters only if they understand the opportunity to reduce their energy bills and change their behaviour" (PAC in *The Daily Telegraph*, 2012) and that the smart meter is "an additional cost people can ill-afford" (PAC in *The Independent*, 2014). At the time, *The Observer*

(2012) wrote, “the utilities love the technology because it will enable them to disconnect consumers remotely who don’t pay their bills”. Consumer protection organizations, in addition, pointed to the “appalling track record” of energy companies and the lack of trust from consumers between 2011 and2013.

The storyline developed from warning about increasing bills to demanding tangible benefits for consumers, “customers, who ultimately foot the bill, need to be confident that they will see tangible benefits that give value for money” (Consumer Focus in *The Daily Telegraph*, 2012). The possibility of saving energy through the installation of smart meters became debatable in the newspapers at the time . Moreover, the parliamentary committees were concerned that the energy department “is depending heavily on assumed competition in the energy industry to control costs… it is something the energy companies don’t have a great track record on” (PAC in *The Independent*, 2014).

Some energy companies, industry “experts” and the energy department responded that “bills should be cheaper… costs savings should, in theory, be passed on to households” (*The Observer*, 2010). Energy companies were told they need to encourage householders to engage with smart meters in order to make “energy-saving decisions after seeing how much is being used by certain actions” (*The Observer*, 2010).

The storyline slightly changed from 2012 onwards: actors added that a competitive market would make sure consumers did not pay too much, “the department and energy companies claim significant savings will be made in the long term. The meters should reduce energy suppliers’ costs, which, the government hopes, will mean more competitive tariffs for consumers” (*The Sunday Times*, 2014).

4.2.3 Big Brother

The dystopian "Big Brother" discourse emphasized how smart meters would enable "spying utilities" and "snooping" to the point where privacy was invaded: companies turning home appliances/electricity supply off remotely and gaining detailed information about people's lifestyles. Contestations associated with the negative discourse "Big Brother" consisted around a code of conduct in relation to the provisions of energy services and privacy issues.

In 2010, a discourse coalition between a consumer protection organization, academics, campaigners, pressure groups, and a data analysis company emerged in the newspaper articles. *The Sunday Times* (2010) wrote that smart meters "will reveal when people are at home, what sort of appliances they are using and even indicate their diet", and that "this could be used by the government, for example, to tell if somebody who is claiming benefits has bought a television, or to tell how many people are living in a particular home". Similarly, *The Guardian* (2011) argued, "Unless we are very careful, we will see Big Brother taking over our homes as power companies get to micro-manage our energy supply and are given complete access to information about how we live".

Between 2012 and2016, an international privacy charity, an independent parliamentary body, and European regulator joined this discourse coalition, pointing to the significant data security and privacy risks. The European Data Protection Supervisor (EDPS) warned, "While the Europe-wide rollout of smart metering systems may bring significant benefits, it will enable massive collection of personal data" (*The Observer*, 2012). Similarly, a campaign group argued, "a smart meter will monitor your home energy consumption, creating a honeypot of data which energy insurance and marketing companies will inevitably be hungry for" (Mail Online,

2016). *The Daily Telegraph* (2012) wrote that "there is a risk that the customer will feel even more captive and question whether there are any real benefits unless the suppliers are willing to add a wider range of services than simply using the "spy" in the home to register electricity and gas consumption".

During the same time, the energy department, UK government, and later on the national campaign for the smart meter rollout, Smart Energy GB, argued that privacy issues were taken seriously and were being addressed. In 2016, DECC claimed, "we have put in place robust security controls which are based on international standards and industry good practices" (*Daily Mail*, 2016).

4.2.4 Hacked and vulnerable grid

The "hacked and vulnerable grid" discourse noted how smart meters could result in an electricity system that was subject to hacking or vulnerable to criminals. Security consultancies, academics, security think tanks, intelligence and security organizations, and parliamentary committees warned how the grid could become vulnerable to hacker attacks, including viruses and malicious software in newspaper articles between 2011 and2016.

The Guardian (2011) warned, for example, that "the threat of internet viruses infecting home computers and mobile phones is something we have all learned to live with, but soon many homes' energy supplies could face similar risks. Security experts say smart meters are also potentially vulnerable to hacking". The parliamentary committee cautioned, "There is a real threat of cyber-attack on the smart communication system" (PAC, *The Sunday Telegraph*, 2012). Similarly, the Mail Online (2012) wrote "intelligence chiefs have warned that plans to install smart energy meters in every house will leave families vulnerable to terrorist attacks… the

plans will create a 'strategic vulnerability', giving foreign computer hackers the opportunity to target individual homes, municipal buildings and even whole districts. Described by security experts as the 'modern day equivalent of a nuclear strike', hackers would be able to switch off meters from overseas, cutting off targets from the national grid". Similarly, *The Observer* (2012) wrote that "the capacity for remote cutoff in a networked system opens up a huge national cybersecurity vulnerability. After all, if E.ON can remotely disconnect every house in East Anglia, so too can a hacker in China".

4.2.5 Families in turmoil

The final, and least prevalent, negative discourse of "families in turmoil" relates to smart meters adding stress or tension to family routines, or worse, breaking families apart. This storyline was mainly grounded in personal anecdotes from householders and an academic study that looked at changes in family routines once energy feedback technologies were installed in the home (see peak in 2011 and2012 in Figure 3).

Making use of household anecdotes between 2008 and2010, *The Sunday Times* (2008) noted that one writer mentioned how smart meters provoked their seven-year-old daughter to shout that "you're destroying the planet, Daddy" … "as she stared into the display unit of my new smart meters. It had seemed an ordinary Sunday morning until then. The tumble dryer was whirring downstairs, the kettle was boiling for my second mug of tea, and a few lights were on here and there". The *Daily Mail* (2010) wrote that smart meters enabled another parent to "become the amusing nag around the house" and *The Sunday Times* (2008) wrote that one person complained their smart meter "turned the children into a kind of eco-police force". *The Independent* (2011) wrote that "in some trials, the meters… yielded negligible savings - and often at the expense of family unity, with people bickering over energy

usage" and that "tension revealed in the study ranged from light-hearted to heated, and sometimes a mixture", with one married couple apparently almost "breaking up" over how a smart meter implicated boiling water in a tea kettle.

5. Discussion: Futures of household low-carbon energy systems

The analysis of smart meters here not only draws attention to common storylines and tropes within the media, but to how futures are shaped in the now through future-orientated discourses (what is being envisioned) and where they are located (where it is said and by whom) (Rafey and Sovacool, 2011:1149). In this light, positive discourses are mainly grounded in conservative and financially rationalized storylines whereas negative discourses were based on contesting positive, emotive, and issue specific storylines.

5.1. Positive discourses: Conservative and financially rationalized storylines

The two most prevalent positive discourses of "empowered consumer" and "energy conscious world" are mainly grounded in short-term, conservative futures where the current energy system can be pretty much maintained. References to the smart grid that are linked to more transformative social and technological changes are rather limited in the newspaper articles (see "low-carbon grid"). Moreover, the two prevailing positive discourses appeal to rational or utilitarian calculations, making apparent the strong dominance of financial rationales referring to energy use and energy efficiency savings on bills. Potential wider societal benefits of creating sustainable, more democratic energy systems are rarely discussed in the newspapers. Further, it is mainly government actors who construct storylines of a smart grid, rather than a diverse set of actors, creating multiple futures of the grid within the newspapers.

In terms of discourse coalitions within the positive discourses, storylines morphed across institutions within the positive discourses over time; different institutions change their stance or promote contradictory and inherently malleable futures. Some coalitions initially supported the prevalent imaginaries of "empowered consumer" and "energy conscious world" only to later abandon them. From 2012, environmental think tanks "left" those discourses and began to develop negative discourses, leaving government actors as the main source of advocates of the current model of the rollout. Obviously, we also see consistent *inconsistency* within newspapers, with none of them subscribing to a single or unchanging storyline.

5.2 Negative discourses: Contesting positive, emotive, and issue specific storylines

These negative discourses were not necessarily grounded in opposing the SMIP, considering that environmental think tanks and consumer protection organizations were part of constructing the two prevalent positive discourses between 2006 and2012. These discourses rather contest the positive discourses, i.e. "empowered consumer" vs. "astronomical bills" and "energy conscious world" vs. "costly disaster". Contestations surrounding who benefits from the rollout (and how) were partly reduced to competing ideas of whether energy savings could be made in the home and whether technologies enabled (or not) certain kinds of technological promises. Somewhat missing from the newspaper articles were attempts to opening up the smart energy debate to broader issues of democracy and justice linked to a smart grid.

Rather than purely contesting the positive discourses, the other three negative discourses presented issue specific storylines mainly grounded in privacy and security

concerns. Some particularly stark storylines were obviously intended to invoke strong emotional reactions. Such storylines made frequently use of metaphors. This included, for instance, envisioning smart meter that are a "spy in the home" (*The Telegraph*, 2013), creating a "permanent window on private live" (*The Times*, 2010) and/or leave "families vulnerable to terrorist attacks", which are described to be the "modern day equivalent of a nuclear strike" (Mail Online, 2012). Within these newspaper articles, smart meters were transformed into an actor who interferes with the Englishman's notion of "my home is my castle" i.e. a private space to do what one pleases, and in the process surveillance activities, stealing data and creating destruction. The connectivity of web-based electronic devices, as represented in the smart meter, have an invisibility and spread that "are not easily grasped without the help of metaphor… to give people a feeling of understanding, journalists exploit analogies with familiar phenomena… highlighting and hiding selected features of the phenomena represented" (Nerlich, 2007: 440). Journalists made use of stark language to construct the negative discourses, potentially highlighting issues of privacy and security but also might hide some of the complexities surrounding these issues. For instance, it is possible to argue, "privacy is not the antidote to surveillance [as portrayed in the newspaper articles]… rather than fighting these connections… we have to see them part of a new landscape of social power" and examine these new power relations (Stalder, 2009: 120, 123).

In terms of discourse coalitions, the negative discourses in particular suggest very different institutions behind particular storylines, resembling themes of fragmentation and diversity. For instance, the "hacked and vulnerable grid" discourse was mainly connected to groups with an expertise and interest in security (partly fragmented from the other storylines), whereas "astronomical bills", "costly disaster",

and “Big Brother” were made up of discourse coalitions representing a diverse set of actors. Such fragmentations and diversity seems to have created a situation where the different institutions were competing over the attention of their particular concern surrounding the rollout within the newspapers. Different parliamentary committees remain part of four discourse coalitions within three negative discourses – suggesting that the SMIP has been extensively scrutinized and contested within the UK parliament.

6. Conclusion and implications

This study has examined the storylines and discourse coalitions of the smart meter rollout within the UK tabloid and broadsheet national press. An analysis of media discourses, coupled with futures research, has shown how and by whom smart meters (and their rollout) are being discussed and envisioned within the UK print media over time. Across the corpus of newspaper articles examined, we identified a collection of nine overlapping albeit still distinct discourses. Four of these – “empowered consumers”, “energy conscious world”, “low-carbon grid”, and “future smart innovation” – depict smart meters as a harbinger of positive social change. Five of these – “hacked and vulnerable grid”, “big brother”, “costly disaster”, “astronomical bills”, and “families in turmoil” – represent smart meters as destructive, negative forces on society.

With this in mind, we offer four core conclusions. First, our analysis reminds us that smart meters possess interpretive flexibility, they reflect contradiction and contestation, and the media discourses reveal that there is no uniform frame or storyline of the type of future such meters can deliver. Smart meters have multivalent and ambiguous meanings and technological promises. Instead of a unifying meta-

discourse, we see distinct futures and storylines in tension. Part of this tension is inherent in the fragmented and issue specific storylines themselves; some discourses are in conflict with others, e.g. "future smart innovation" is about benefitting industry, whereas "empowered consumers" comes partly at the expense of industry. Others are grounded in directly opposing imaginaries, e.g. "energy efficient world" is about making the use of energy more efficient through technologies, whereas "costly failure" is grounded in the technologies failing to achieve envisioned benefits.

Second, the existence of rather contradictory discourses over time does more than merely make apparent how highly polemic the SMIP rollout has been. From a socio-technical perspective, such conflicting discourses remind us that technological promises are highly uncertain and can therefore reflect competing values, visions, and interests. These contestations were not necessarily grounded in purely debating "for or against" the rollout of smart meters, but rather represented continuous struggles over the technological promises and associated implementation of smart technologies where several imaginaries survived over time. In the newspaper articles, smart meters within the positive discourses are somehow regarded as neutral, as if energy savings are inherent to the meters themselves. The negative discourses put this assumption into question, i.e. from "empowered consumer" to "astronomical bills". Even so, contestations were often reduced to competing ideas connected to technological promises. Somewhat missing were attempts to open up the smart energy debate to broader issues of democracy, power and justice linked to a smart grid.

Third, and critically, the analysis draws attention to looking beyond the substance of smart meter discourses (what is being said) to where they are located (where it is said and by whom) (Rafey and Sovacool, 2011: 1149). Discourses do not float freely or independently from actors, and are instead deeply tied to institutions

and discourse coalitions, and embedded into practices. Here, three interesting themes emerged: that of fluidity over time, and those of fragmentation and diversity. In terms of fluidity, storylines and discourses change and morph across institutions over time – different institutions change their stance or promote contradictory discourses – from supporting certain futures to openly contesting them in relation to struggles over technological promises and implementation ideas (see "empowered consumer" to "astronomical bills"). In terms of fragmentation and diversity, the negative smart meter discourses in particular suggest either different institutions or a diverse set of institutions behind particular discourses and often issues-specific storylines (such as privacy concerns). These issue-specific storylines connected to negative discourses seem to compete for attention in the newspaper, potentially struggling to gain traction beyond making people aware of particular issues.

Fourth, both the limitations with, and findings from, this study point to areas of future research. This study has examined media discourses around the smart meter rollout for homes and small businesses, but other work could examine smart meter deployment and discourse in other areas, such as larger non-domestic (commercial) buildings or even industrial facilities (Ma et al. 2017; Ma and Cai 2018). This study has focused only on the national program within the United Kingdom, yet the discourses associated with other programs could be investigated, especially "frontrunner" European countries such as Estonia, Finland, Malta, Spain, and Sweden, or, conversely, laggards and waverers such as Bulgaria and the Czech Republic (Shivakumar et al. 2018). This study has analysed only broadsheet and tabloid newspaper coverage, yet it is likely narratives and discursive coalitions occur in other modes and via other mediums as well, including policy documents, social media, and even intellectual property and patents. These other sources would be

worth examining to get a more complete picture of how smart meter discourses operate. Lastly, this study has used the notion of a discourse and discursive coalitions as a unifying conceptual approach, but others exist, notably sociotechnical imaginaries (Jasanoff and Kim 2015; Ballo 2015; Skjølsvold et al. 2015; Cherry et al. 2017) or the sociology of expectations (Van Lente 1993; Berkout 2006; Bakker et al. 2011; Borup et al. 2006), which can also yield insights into the discursive politics and symbolic meanings attached to smart meters (and indeed other technologies).

Nonetheless, the existence of the nine negative and positive discourses identified implies that the smart meter rollout is being publically (and vigorously) debated and deconstructed, and it represents a diverse collection of positive and negative future visions. In this way, media discourses can open up the politics of knowledge production to a wider audience: drawing attention to privacy concerns and potential rising energy costs, to name a few. Then again, newspapers might also follow their own agendas surrounding the rollout through a prevalence of either negative and positive discourses. In this sense, the media might act as far more than a process of mediation between expert knowledge and public comprehension (Becken, 2014: 126). The discourses and visions themselves influence both actors and institutions, at times raising issues otherwise ignored, while at other times limiting possible futures and topics of contestations that follow.

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